

## CLAIM AMENDMENTS

Claim 1 (canceled).

2. (currently amended) A current sensor using a ~~sagnac~~Sagnac interferometer according to Claim 1, further comprising

- a light source,
- a first optical branch unit on which light from the light source impinges,
- a first depolarizer on which light from the first optical branch unit impinges and which emits non-polarized light,
- a first polarization filter on which light emitted from the first depolarizer impinges and which emits a given linearly polarized light,
- a second optical branch unit for branching light emitted from the first polarization filter into two beams,
- an optical phase modulator connected to one branch end of the second optical branch unit,
- a current sensing coil on which light from the other branch end of the second optical branch unit and light from the optical phase modulator impinge as levorotatory light and dextrorotatory light,
- a first quarter-wave plate inserted between the optical phase modulator and the current sensing coil,
- a second quarter-wave plate inserted between the other branch end of the second optical branch unit and the current sensing coil,
- a light detector connected to said first optical branch unit,
- a second depolarizer and a second polarization filter connected in series between the optical phase modulator and the first quarter-wave plate; and
- a third depolarizer and a third polarization filter connected in series between the other branch end of the second optical branch unit and the second quarter-wave plate, the second depolarizer being connected to the optical phase modulator side and the third depolarizer being connected to the second optical branch unit side.

3. (currently amended) A current sensor using a ~~sagnac~~Sagnac interferometer according to Claim 2 in which the first depolarizer, the second depolarizer and the third depolarizer are formed by polarization maintaining optical fibers, each of said depolarizers has its own the group delay

time difference between orthogonal components of light occurring therein, and the respective group delay time differences of the respective in each depolarizers are being in the ratio greater than 1:2:4 without regard to the sequence of the first, the second and the third depolarizers.

4. (currently amended) A current sensor using a ~~sagnac~~Sagnac interferometer comprising:  
including

a light source,

a light detector,

an optical ~~directional coupler branch unit,~~

connecting means for connecting said light source and light detector to said optical branch unit on which light from the light source impinges, ~~a first polarization filter on which light emitted from the optical directional coupler impinges and which emits a given linearly polarized light, a second optical branch unit for branching light emitted from the first polarization filter impinges and which branches the thus impinged light into two beams,~~

an optical phase modulator connected to one branch end of the ~~second optical branch unit,~~

a first depolarizer connected to the optical phase modulator,

a first polarization filter connected to the first depolarizer,

a first quarter-wave plate connected to the first polarization filter,

a second depolarizer connected to the other branch end of the optical branch unit,

a second polarization filter connected to the second depolarizer,

a second quarter-wave plate connected to the second polarization filter, and

a current sensing coil connected to the first quarter wave plate and to the second quarter wave plate, on which a levorotatory light and dextrorotatory light from the ~~other branch end of the second optical branch unit~~ quarter wave plate and the optical phase modulator first quarter wave plate impinge, ~~a first quarter-wave plate inserted between the optical phase modulator and the current sensing coil, and a second quarter-wave plate inserted between the other branch end of the second optical branch unit and the current sensing coil;~~ further comprising

~~a second depolarizer and a second polarization filter connected in series between the optical phase modulator and the first quarter-wave plate;~~

and

~~a third depolarizer and a third polarization filter connected in series between the other branch end of the second optical branch unit and the second quarter-wave plate;~~

~~the second depolarizer being connected to the optical phase modulator side and the third depolarizer being connected to the second optical branch unit side, the light source being a light source which emits non-polarized light.~~

5. (currently amended) A current sensor using a ~~sagnae~~Sagnac interferometer according to Claim 4 in which the ~~first second~~ depolarizer and the ~~second third~~ depolarizer are formed by polarization maintaining optical fibers, each of said depolarizers has its own and the group delay time differences between the orthogonal components of light occurring therein, and the respective group delay time differences of the respective in the both depolarizers are being in a ratio equal to or greater than 1:2.

Claims 6-7 (canceled).

8. (currently amended) A current sensor using a ~~sagnae~~Sagnac interferometer ~~according to Claim 6 or 7~~ comprising:

a light source,

a light detector,

an optical branch unit,

connecting means for connecting said light source and light detector to said optical branch unit on which light from the light source impinges and which branches the thus impinged light into two beams,

an optical phase modulator connected to one branch end of the optical branch unit,

a first quarter-wave plate connected to the optical phase modulator,

a second quarter-wave plate connected to the other branch end of the optical branch unit,

a current sensing coil connected to the first quarter wave plate and to the second quarter wave plate, on which a levorotatory light and dextrorotatory light from the second quarter wave plate and the first quarter wave plate impinge,

a first length adjusting optical coil connected in series in a first optical path between the one branch end of the optical branch unit and the first quarter-wave plate, and

a second length adjusting optical fiber coil connected in series in a second optical path between the other branch end of the optical branch unit and the second quarter-wave plate, in which the current sensing coil has a center axis which is substantially aligned on a common rectilinear line

as the center axes of the first and the second length adjusting optical fiber coils, the current sensing coil and the both length adjusting optical fiber coils satisfying the following inequality:

$$|R_c \times L_c + R_1 \times L_1 - R_2 \times L_2| < 5$$

$$|R_c \times L_c + R_1 \times L_1 - R_2 \times L_2| < 5$$

where  $R_c$ : a mean radius of the current sensing coil

$L_c$ : optical fiber length of the current sensing coil

$R_1$ : a mean radius of the first length adjusting optical fiber

$L_1$ : optical fiber length of the first length adjusting optical fiber coil

$R_2$ : mean radius of the second length adjusting optical fiber coil

$L_2$ : optical fiber length of the second length adjusting optical fiber coil.

9. (currently amended) A current sensor using a ~~sagnae~~Sagnac interferometer according to Claim ~~2 6 or 7~~ in which an optical fiber which forms at least one of a first an-optical path between one branch end of the second-optical branch unit and the first quarter-wave plate and an-optical fiber which a second defines-an-optical path between the other branch end of the second-optical branch unit and the second quarter-wave plate ~~are-is~~ formed by a single mode optical fibers having a cut-off wavelengths which are-by-is at least 100 nm longer than the wavelength of the light source.

10. (currently amended) A current sensor using a ~~sagnae~~Sagnac interferometer according to one of Claims ~~1 2 to 7~~ Claim 2 further comprising in which a separation is made a first optical connector, a second optical connector, and an extended optical fiber connecting between the first optical connector and the second optical connector, which are inserted between the first optical branch unit directional coupler and the second optical branch unit, and the optical directional coupler and the second optical branch unit are connected together by a first optical connector, a second optical connector, and an extended optical fiber which connects between the first optical connector and the second optical connector.

11. (currently amended) A current sensor using a ~~sagnae~~Sagnac interferometer according to one of Claims ~~1 to 7 in which a separation is made~~ 2, 4 or 8, further comprising a first optical connector, a second optical connector and a first extended optical fiber connecting between the first optical connector and the second optical connector, which are inserted

in a first optical path between the second branch unit on one hand and the first quarter-wave plate,  
and

a third optical connector, a fourth optical connector and a second extended optical fiber  
connecting between the third optical connector and the fourth optical connector, which are inserted  
in a second optical path between the second branch unit and the second quarter-wave plate on the  
other hand, and the second branch unit and either quarter-wave plate are connected together by a  
first optical connector, a second optical connector and an extended optical fiber which connects  
between the first optical connector and the second optical connector.

12. (new) A current sensor using a Sagnac interferometer according to claim 8, further comprising:

a first depolarizer,

a first polarization filter connected in series to the first depolarizer, the series circuit of the first depolarizer and first polarization filter being inserted in said first optical path such that the first depolarizer is connected to the first length adjusting optical coil and the first polarization filter is connected to the first quarter-wave plate,

a second depolarizer, and

a second polarization filter connected in series to the second depolarizer, the series circuit of the second depolarizer and second polarization filter being inserted in said second optical path such that the second depolarizer is connected to the second length adjusting optical coil and the second polarization filter is connected to the second quarter-wave plate.

13. (new) A current sensor using a Sagnac interferometer according to claim 8, wherein said connecting means comprises:

an optical directional coupler on which light from the light source impinges,

a first depolarizer on which light from the optical directional coupler impinges and which emits non-polarized light, and

a first polarization filter on which light emitted from the first depolarizer impinges and which emits a given linearly polarized light.